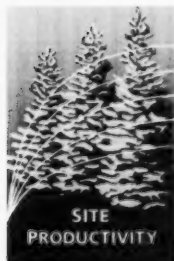


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Site Index Conversion Equations for Mixed Black Spruce–Lodgepole Pine Stands

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**Abstract**

Site index conversion equations allow the site index of one species to be estimated from the site index of another species when they are growing in mixed stands or for stand conversions. This study develops site index conversion equations for mixed black spruce (*Picea mariana* [Mill.] B.S.P.)–lodgepole pine (*Pinus contorta* var. *latifolia* Dougl.) stands. The data come from plots established in northern British Columbia by the University of British Columbia. Twenty-six plots with height and breast height age measurements for both black spruce and lodgepole pine were available. The site indexes for both species were estimated from these data and the geometric mean regression line was fit, resulting in a site index conversion equation.

Introduction

Black spruce (*Picea mariana* [Mill.] B.S.P.) is abundant in the Boreal White and Black Spruce (BWBS) biogeoclimatic zone in British Columbia, and is common in the Sub-Boreal Spruce (SBS) zone (Watts [editor] 1983; Meidinger and Pojar 1991). Black spruce is also present, but not common, in the Spruce–Willow–Birch and Interior

Cedar–Hemlock zones (Watts [editor] 1983; Meidinger and Pojar 1991). It often forms associations with lodgepole pine (*Pinus contorta* var. *latifolia* Dougl.) (Meidinger and Pojar 1991; MacKinnon et al. [editors] 1992).

Site index, which is a measure of site productivity, is the top height of a stand at breast height age 50. Often, the site index of one species in a mixed species stand is known but the site index of the other species is not known. Site index conversion equations are simple linear equations that allow the site index of one species to be predicted from the site index of another species when the two species are growing in mixed stands (Nigh 1995). These equations can also be used with caution in stand conversion situations—for example, when a stand of one species is harvested and replaced with a stand of another species.

This extension note briefly describes the development of site index conversion equations for mixed black spruce–lodgepole pine stands.

Data

The data for this study come from stem analysis plots established in northern British Columbia by the University of British Columbia as part

of a site productivity study for black spruce. Twenty-six plots with top height and breast height age measurements for black spruce and lodgepole pine were selected from the complete data set. These plots were located in the BWBS dry cool, moist warm, and wet cool subzones, and in the SBS dry warm subzone (Meidinger and Pojar 1991). The top height and breast height age of each species in the plot were used as predictor variables in the height-age models to estimate site index (Goudie 1984; Alberta Forest Service 1985).

Methods

A graph of the site index of black spruce plotted against the site index of lodgepole pine was prepared (Figure 1) and a linear relationship was observed. The geometric mean re-

gression line (Ricker 1984; Nigh 1995) was then fit through the data points.

Results

Summary statistics for the site indexes of the species are shown in Table 1. The fitted geometric mean regression line is

$$SI_{sb} = 2.765 + 0.6387 \times SI_{pl}, \quad (1)$$

where:

SI_{sb} = the site index (m) of black spruce, and

SI_{pl} = the site index (m) of lodgepole pine.

Figure 1 shows the fitted line, equation (1). By algebraically inverting equation (1), the site index of lodgepole pine can be predicted from the site index of black spruce, equation (2):

$$SI_{pl} = -4.329 + 1.566 \times SI_{sb}. \quad (2)$$

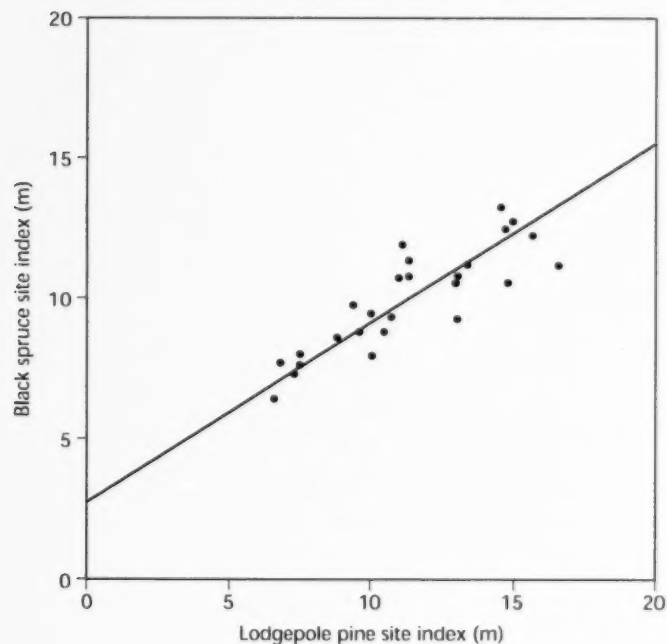


FIGURE 1 The fitted black spruce-lodgepole pine site index conversion equation (—) overlaid on the data points (•).

TABLE 1 Statistics for the black spruce and lodgepole pine site indexes

Species ^a	No. of observations	Site index (m)		
		Mean	SD ^b	Correlation
Sb	26	9.983	1.863	0.8587
Pl	26	11.30	2.917	

a Sb—black spruce, Pl—lodgepole pine

b SD—standard deviation

Discussion and Conclusion

This extension note makes site index conversion equations available for mixed black spruce–lodgepole pine stands. These equations will be of most use in the BWBS zone, but will also be applicable in the SBS zone. Although all the data came from these two zones, the conversion equations can be applied to mixed black spruce–lodgepole pine stands in other parts of British Columbia. This extrapolation is allowed because these species mixtures will be relatively rare in other parts of the province. Although this rarity makes supplementing the data set with data from other biogeoclimatic zones difficult, it also means that any application error will be small.

The correlation between black spruce site index and lodgepole pine site index is strong (Table 1; Figure 1). Lodgepole pine is generally faster growing than black spruce (i.e., it has a higher site index), likely due to the sites on which the mixture is found. The mixed black spruce–lodgepole pine stands are on drier, upland sites better suited to pine. The lowest site indexes are for plots in the BWBSmw2 subzone.

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